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REVIEWS.

Geological Survey of Georgia: The Paleozoic Group: The Geology of Ten Counties of Northwestern Georgia, and Resources. By J. W. SPENCER, A.M., PH.D., F.G.S. (L. and A.), State Geologist. Published by Authority. Atlanta, Ga. Geo. W. Harrison, State Printer, 1893.

The state of Georgia has been somewhat unfortunate in the matter of Geological Surveys. That under the direction of Dr. George Little was discontinued before the publication of any extended report upon the work accomplished, and thus the results of a number of years of field work by competent geologists were lost to the state. The survey under Dr. Spencer was from the first heavily handicapped by the action of the Advisory Board in appointing the assistants without consultation with the State Geologist. It seems probable that this action of the Board will have the result of causing the loss to the state of all the work of the assistants so appointed. It is very much to be hoped that the Advisory Board will profit by past experience, and under the new organization will leave the choice of his assistants to the State Geologist, Professor Yeates, who is the successor of Dr. Spencer in this important position. Under no other conditions could a geologist with any justice be held responsible for the conduct and results of a survey.

The present volume records the work of Dr. Spencer in the Paleozoic terrane of Georgia, and a previously published report has dealt with the Tertiary and newer formations of the southern part of the state.

In chapter I, there is a general sketch of the geological structure of northwestern Georgia, in which are discussed in general terms, and in non-technical language, the formation and destruction of rocks; the effects of terrestrial movements on the growth of strata; the disturbances and dislocations of the original beds; the origin of valleys. In chapter II, the formations of northwestern Georgia are given in tabular form, with their equivalents in other states; in general the names first proposed by Dr. Safford for Tennessee find acceptance in this report, as they must with all who have to do with the Paleozoic formations of the states adjacent to Tennessee, for the descriptions and classifications of Dr. Safford are remarkably true to nature. Chapters III to VI inclusive are devoted to a general description of the lithological and other characters of the different formations which make up the area under consideration in Georgia. The Ocoee group, which Dr. Safford places at the base of the Cambrian in Tennessee, or beneath the oldest of the fossiliferous strata, is mentioned by Dr. Spencer, but he does not enter into its detailed description. This group of semi-crystalline slates, often designated as hydro-mica schists, talcoid schists, and formerly as talcose schists, and which bears the greater part of the auriferous quartz veins in Georgia and Alabama, is extremely difficult to assign to its proper place in the series, in Alabama at least, for we find in the southeastern part of the Alabama Paleozoic terrane, some of the Knox or Montevallo shales slightly altered into partially crystalline slates, which we have not yet been able to discriminate from the unquestioned Ocoee. It has therefore seemed to us at least possible that the Alabama representatives of the Ocoee of Tennessee may be, in part at least, altered Cambrian shales. In chapter VIII the river alluviums and other formations later than the Carboniferous are mentioned, and it is interesting to find that remnants of the Lafayette, in the form of pebbles and red loam, are to be found in many places in the Coosa Basin at elevations of 100 to 150 feet above the present level of the waters in those regions. These same beds have been traced by the Alabama survey up the Coosa valley to the Georgia line, and they are also to be found extending from the west, for a good many miles within the Alabama line along the Tennessee river.

In chapter IX, dealing with the general physical features of the region, Dr. Spencer directs attention to the ancient character of the streams, and concludes that they long ago reached their base level of erosion, and have since been engaged in widening their valleys. In comparatively modern times (Lafayette), there has been a depression which has allowed the deposition of pebbles and loams at altitudes 80 to 150 feet above the present stream level, and of course a still more recent movement of elevation which has brought the streams to their present position. Probably the most striking memorial of these movements is to be found in the "flatwoods" of the Coosa Valley. This chapter is illustrated by a number of sections. Chapters X to XX inclusive, are devoted to the detailed description of the local geology of each of the counties embraced in this region.

Part II (chapters XXI–XL inclusive) deals with the Economic Resources of the Paleozoic group, which are limonite, hematite, manganese ores, beauxite, coal, limestones, sandstones, and clays. The mode of occurrence of these materials, their distribution both geographical and geological, their analyses, etc., are shown forth in sufficient detail, and a commendable feature of Dr. Spencer's treatment is found in the explanations and suggestions as to the origin of these various ores, expressed in terms which are easy of comprehension even by those who have not had any special geological or chemical training. In this way the book has a direct educational value apart from the great amount of information as to local occurrences which it contains. The chapter on beauxite is of special interest, because of recent developments in the mining and shipping of this valuable substance from the Georgia and Alabama mines. The occurrence and general character of the ore in the two states are identical, in fact the ores belong practically to a continuous deposit, in close connection with the strata of the Knox Dolomite. On account of competition with the foreign beauxites, only the higher grades of the ore, containing from 55 per cent. and upwards of alumina, are shipped, and by far the greater part of this goes to the making of *alum*. This seems a wanton waste, since the inferior grades would answer for alum, and the higher grades should be reserved for the manufacture of the metal.

The coal of Georgia is confined to an area of about 200 square miles on the plateaus of Sand and Lookout Mountains. It is furnished almost entirely by two or three seams lying between the Upper and Lower Conglomerates near the base of the Coal Measures, as is the case also in Tennessee and the Plateau region of Alabama. In all this territory, these seams and the strata by which they are separated, are exceedingly variable in thickness. The most widely distributed of these is the Castle Rock seam just below the Upper Conglomerate (Main Etna and Cliff seams of Alabama and Tennessee). In Georgia the Dade seam, some 30 feet or more below the preceding, appears to be more extensively worked, and, in the sections given, of greater average thickness. This seam also has been worked in Alabama, where it is known as the Eureka seam. Still below this in all the states mentioned is another seam of great importance locally, the Red Ash seam.

In one locality, Round Mountain, which rises above the Lookout

Table land as a prominent eminence, an important seam is described by Dr. Spencer, which lies many feet higher up in the measures, and which so far as we know does not occur in that part of Lookout Mountain that extends into Alabama.

The clays described are of several kinds, (1) the kaolin-like clays, (2) the residual clays from the decomposition of limestones and calcareous shales, (3) the clays formed from the disintegration of shales, and (4) the alluvial clays. The first variety occurs in "horses" or in sheets or pockets in the residual earths from the decomposition of the strata of the Knox Dolomite and Fort Payne series. These are often quite pure and white, and have nearly the theoretical composition of kaolin. Although they occur in the residual matters they are not, according to Dr. Spencer, *residua* of the limestones, but are derived from the rocks of the metamorphic series.

The residual clays produce sometimes fairly good brick, but they are generally too rich in fusible materials to make fine products. Of greatest promise are the clays derived from the disintegration of shales and slates, some of which have given beautiful vitrified brick, such as would probably be well suited to serve as paving brick. The alluvial clays, especially such as belong to the Second Bottom deposits, in Georgia as well as in Alabama and Mississippi, furnish by far the greater part of the material for the manufacture of ordinary building brick, and it is of interest to note that the best quality of building brick along the whole Appalachian region is made from deposits of this character.

In chapters XL and XLI we have a plea for better roads, with numerous illustrations of country roads in Europe and America, which emphasize sufficiently well the contrast between good roads and bad ones. This is a seasonable chapter in view of the great interest now being awakened in the subject of better roads throughout the southern states.

Part III, chapters XLII to XLIV, is devoted to the discussion of the origin and characteristics of the soils derived from the various Paleozoic formations, and the composition of these soils is shown also by a number of chemical analyses.

An appendix containing acknowledgments and an account of the progress of the Survey, a classified table of contents and a full index conclude the volume. The base of the map has been compiled chiefly from the topographic sheets of the U. S. Geological Survey, and in the mapping of the geological formations, Dr. Spencer acknowledges the valuable aid which he has had from the previous work of Dr. C. W. Hayes in this territory. The map shows in a very clear and satisfactory manner the areal distribution of the formations. We cannot, however, speak so much in praise of the cross sections, in which the vertical scale is so greatly exaggerated as to be quite misleading.

We consider this the most important of the official documents yet issued by the State of Georgia, and it is to be regretted that during his term of office Dr. Spencer did not have that complete control of the Survey that would have insured the publication of other reports of equal importance, especially one on the Crystalline Schists of the state.

E. A. SMITH.

Annual Report of the Geological Survey of Arkansas for 1890; J. C. BRANNER, State Geologist; Volume IV., *Marbles and Other Limestones*, by T. C. HOPKINS, 8vo., 443 pp., illustrated by cuts and plates, and accompanied by an atlas containing six sheets.

THIS volume is the latest of the series of volumes published by the Geological Survey of Arkansas. It is separated into three divisions, which are sub-divided into twenty-eight chapters. The first division is the introductory chapter on the "General Description of the Marble Area." After this comes Part I., which treats of limestones, including the following topics: "Composition and Origin of Limestone," "Varieties of Limestone," "Geologic and Geographic Distribution of Limestones," "Limestone as a Building Stone," "Miscellaneous Uses of Limestone," "The Carboniferous Limestones of North Arkansas," "The Silurian Limestones of North Arkansas," "Carboniferous Limestones South of the Boston Mountains," and "The Lime Industry of Arkansas."

Part II. treats of marbles, including the following topics: "The Origin and Uses of Marbles," "Marble in the United States," "Marble in Other Countries," "Marbles of Arkansas," "St. Clair Marble," "The Distribution of the St. Clair Marble," "St. Joe Marble," "Distribution of the St. Joe Marble," "Other Marbles found in Arkansas," "Quarrying, and Cutting, Dressing and Polishing Marble." In addition to this there is an appendix treating of the "Faults of the Marble Area of Northern Arkansas." Like many of the other